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## **Measuring the benefits from R&D investment beyond the farm gate: the case of the WA wine industry<sup>\*</sup>**

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## Abstract

Evaluations of public sector agricultural research and development (R&D) often focus on farm level benefits. Flow-on benefits that accrue to other sectors such as processing and marketing typically are ignored. This paper however includes these benefits. Using the Western Australian wine industry as an example this paper highlights the relative importance of farm and flow-on benefits generated by farm-level R&D. A wine industry value chain model is used to measure these benefits. The benefits per dollar of R&D investment are found to be \$2.8 at the farm level compared to \$14.9 when flow-on benefits are taken into account. In this case, solely reporting farm level benefits hugely understates the returns to the R&D investment. The R&D policy implications of the inclusion of flow-on benefits are discussed briefly.

Key words: R&D investment, Benefit cost analysis, Value chain modelling, wine.

## 1. Introduction

*Ex ante* and *ex post* benefit cost analyses of research projects or proposals often are part of the research and funding reviews of agricultural R&D providers and funders (Alston *et al*, 1995; Fan and Hazell, 1997; Kingwell, 1999; Marra, Pardey. and Alston, 2002; Lindner and McLeod, 2008). However, the common practice in many benefit cost analyses of agricultural projects is to not account for benefits that accrue beyond the farm gate (Islam, 2005 and 2006; and Coyle 2007). This oversight can be due to a lack of data or lack of access to appropriate tools to measure such benefits.

However, agriculture is typically the first stage in a paddock-to-plate food transformation and distribution system. Hence, sole consideration of farm level benefits will almost certainly understate the benefits that flow from agricultural R&D. Given the multistage production systems associated with many agricultural commodities, R&D investment in one stage of production will have flow-on effects to other stages of processing, distribution and marketing. Exclusion of benefits beyond the farm gate may lead to inappropriate allocation of research funds either to or within

the agriculture sector, especially where research prioritization decisions are made solely on the basis of farm-level returns.

Some studies have examined multistage production systems involving agriculture and these studies show how R&D investment in one stage of production benefits other stages (Alston, Freebairn and James, 2004; Zhao, Anderson and Wittwer, 2003; Zhao, 2002; Wohlgenant, 1997; Holloway, 1989; Alston and Scobie, 1983; Freebairn, Davis and Edwards, 1982). However, few of these studies combine the identification of the flow-on benefits with an investment analysis to further facilitate R&D priority-setting (Lindner and Jarrett, 1978; Wise, 1986; Harvey, 1988; Alston, Norton and Pardey, 1995; Wohlgenant, 1997; Kingwell, 1999).

This study combines the identification of flow-on benefits in a multistage system (wine production in Western Australia) with a discussion of the implications for R&D investment policy. The main objective of this paper is to demonstrate how the exclusion of benefits beyond the farm gate affects investment evaluation and can lead to inappropriate R&D investment and R&D policy.

The paper is organised in 6 sections. Section 2 gives a brief background of the project. Reviews of previous studies are discussed in section 3. The investment analysis methodology is described in Section 4. Results are presented in Section 5 and in Section 6 results are discussed and conclusions given.

## **2. Background of Premium Wine Grape project**

Over the past two decades the WA wine industry has gradually established its reputation for differentiated<sup>†</sup> wine (Ward, 2007). Supporting the growth of the industry has been wine R&D undertaken by Department of Agriculture and Food (DAFWA) researchers. This research is planned in consultation with the wine industry through the Wine Industry Association of Western Australia (WIAWA). The main aim of this R&D is to ensure the long term sustainable development of the

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<sup>†</sup>The wine market is divided into differentiated (super-premium, ultra-premium, icon wines) and commodity (popular-medium wines) quality categories, after Lokshin, Rabobank. Differentiated wine is premium quality wine sold at retail price of \$10 and above per bottle of 750ml. in this analysis the sale value estimation is based on the price of 750 ml bottle..

industry, typically though improved product quality, security and sustainability of supply. More specifically, in recent years, the strategic shift in R&D has been to focus more on reducing the cost of production of grapes through different environmentally sustainable management practices and to shift the production mix away from commodity<sup>‡</sup> wine grapes to differentiated (premium) wine grapes. The intention is to move from the current ratio of 30:70 to 70:30, to capture price premiums and better utilise the advantage of environmental reliability of Western Australia.

### 3. Review of literature

Economic studies undertaken since 1950s beginning with Griliches' (1958) pioneering cost-benefit study of hybrid corn research have indicated very high social rates of returns from the investment on agricultural research; and the benefits of research have been measured using various approaches. Following Harris and Lloyd (2001) these approaches can be classified as:

- (i) Empirical (Griliches (1958, 1964); Evenson, Waggoner and Ruttan, 1979; Marsden *et al.*, 1980; Ruttan, 1982; Scobie, 1986; Duncan, 1972; Alston *et al.*, 2002),
- (ii) Theoretical economic surplus (Wise, 1975; Browning, 1976&1978; Hertford and Schmitz, 1977; Linder and Jarrett, 1978; Rose, 1980; Wise and Fell, 1980; Davis, 1981; Edwards and Freebairn, 1981&1984; Norton and Davis, 1981; Findlay and Jones, 1982; Fox, 1985; Ballard, Shoven and Whalley, 1985; Norton, Ganoza and Pomareda, 1987; Alston, Edwards and Freebairn, 1988; Oehmke, 1988; MacLaren, 1989; Miller and Tolley, 1989; Zachariah, Fox and Brinkman, 1989; Zachariah, Fox and Brinkman 1989; Widmer Fox and Brinkman 1988; Findlay *et al.*, 1989; Voon and Edwards. 1991; Lindner and McLeod, 2008), and
- (iii) Production functions (Norton and Davis, 1981; Scobie, 1986; Thirtle and Bottomley, 1988).

Of these studies some investigate multistage production systems. Zhao (2002) and Zhao *et al* (2003) analyse the share of costs and benefits of R&D investments among various sectors in the Australian grape and wine industry. The analysis considers four

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<sup>‡</sup> Commodity wine includes bottles sold below \$10/bottle.

groups: growers, wine makers, overseas consumers and government. They use a multisectoral partial equilibrium model of the markets for two types of Australian grapes and wine (premium and non-premium) to study the distributions of returns from the investment in different types of research and promotion. They assume that all sectors are profit maximisers and the technologies are characterised by constant returns to scale. A set of demand and supply equations with a general functional form is used to describe the relationships among various groups. The impacts of alternative R&D and promotion investments are modelled as 15 exogenous variables that shift the relevant supply or demand curves. Changes in price or quantity that result from new technologies or promotion are then solved to obtain estimates of the benefits realised by the various groups in the industry. Zhao *et al* conclude that grape growers, wine makers and overseas consumers receive bigger proportions of the gains than their proportional costs, but that the government and other domestic parties bear a much higher proportion of costs than returns, with producers being the largest beneficiary.

Holloway (1989) analysed the distribution of research gains by using a competitive two stage model, two sequential stages namely processing and distribution. Adding further to the findings of research by Alston and Scobie (1983) that substitution elasticities influence significantly the distribution of research benefits in a multistage system, Holloway concluded that an equally important factor is the stage in marketing to which research is directed.

Freebairn (1982) examined the effect that research at one stage of the production chain has on other stages and on consumers. Three production stages in providing food products to consumers were considered: an input supply sector providing off-farm inputs; a farm sector; and a marketing sector providing off-farm storage, transport, processing and distribution. Benefits were measured as changes in economic surplus. He compared the effects of research that reduces farm production and marketing service costs. The assumption was that the supply of non farm inputs and of marketing goods and services was perfectly elastic. Freebairn concluded that farmers and consumers benefit from research in the input supply and marketing production stages as well as in the farm stage. Under perfect competition, the relative distribution of benefit between sectors depended on the elasticity of retail demand and

the supply elasticities of value added at each stage of the production chain. The more inelastic a sector's supply was relative to that of other sectors, the greater would be the share of research gains for that sector. The aggregate gain was little affected by the changes in price elasticities.

Wohlgenant (1993) also analysed the returns from research directed to different stages of production/ marketing in a multistage production system. He extended the model developed by Freebairn (1982) to include promotion. He concluded that a producer financed programme that led to either an increase in retail demand from promotion or a decrease in marketing costs from research would generate returns to producers that were generally smaller than the returns generated through an equivalent change in producer supply from research.

In all the above mentioned studies, R&D investment in one sector stage of production is shown to benefit all other sectors or stages in the production system. However, there is little exploration in these papers of the implications for investment prioritization. This paper uses value chain modelling approach to estimate flow-on benefits and then discusses the implications for R&D priority-setting.

#### **4. Method of analysis**

As a first step of the analysis, a value chain model of the Western Australian wine industry is developed to provide annual estimates of the physical and financial flows within the industry in terms of quantities and prices of inputs used and outputs sold at each stage of product flow, from the farm (vineyard) to markets (retails and exports). In the second step, the model is used to simulate the expected research outcomes, thereby generating new sets of physical and financial flows within the industry's value chain. The differences between the estimates (*with* and *without* R&D) are used in an investment analysis. The key steps in the analysis are further described in the following sub-sections.

#### 4.1 Value chain model

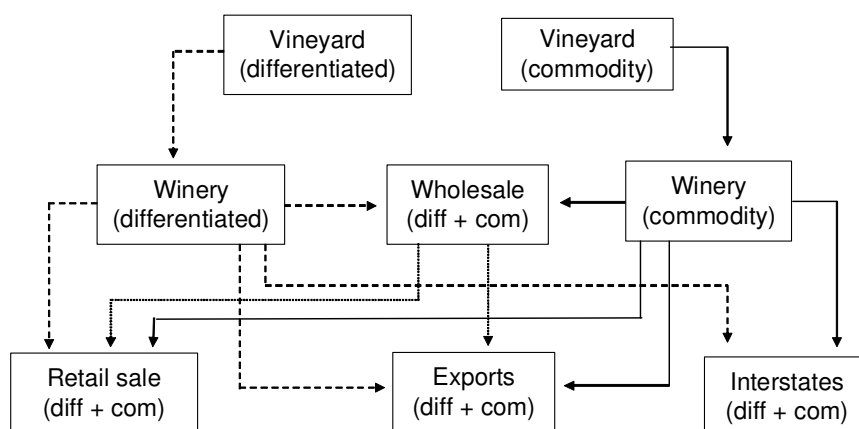
A value chain model provides estimates of the physical and financial flows within an industry's value chain (Islam, 1997, 2003). The model comprises farm and non-farm segments. The non-farm component is divided into various sectors depending on the number of product transformation stages, analytical requirements and availability of data. The model is developed in three steps.

1. Identify sectors or product flow/transformation stages from farm to markets.
2. Establish the linkages between the sectors using data on the percentage of product flow from one stage to another and the product conversion parameters.
3. Calculate the costs, benefits and value<sup>§</sup> added by each sector, using data on prices and quantities of inputs used and output sold.

The physical structure of Western Australian wine industry value chain model is illustrated in Figure 1. Vertically the industry is divided into six sectors: winegrowers, wineries, wholesalers, retailers, exports to other States and overseas exports. Horizontally, both the growers' and wineries' sectors are divided in to two for the production of differentiated and commodity wine grapes and wine respectively.

**Figure: 1**

**Physical structure of WA wine industry including the flow of wine**



<sup>§</sup> For details about value chain model and the data, assumptions and other information used in the wine model, please refer to Appendices I and II.

The farm sector includes commodity and differentiated\*\* wine production, whereas the non farm sector includes wineries (commodity and differentiated), wholesalers, retailers, interstate exporters and overseas exporters. The costs of inputs and revenues from outputs for each sector in the model are calculated separately and added together to obtain the total annual value of cost and benefits for the industry as a whole in a typical year. The arrow direction indicates the flow of outputs from one stage to the others.

In the base model the production ratio of differentiated and commodity wine grapes is 30:70. The research team of the Premium wine industry project expects two major outcomes from the project:

- a shift in the proportion of differentiated and commodity wine grapes production from the current ratio of 30:70 to an expected ratio of 70:30. (the researchers note that total quantity produced may possibly be unchanged); and
- a reduction of 10% in the cost of production of differentiated wine grapes at vineyard level.

The base model is simulated with the above two scenarios to generate estimates of values on costs and benefits across the value chain of the industry. These estimated costs and benefits are given in Table 1.

**Table: 1**  
**Estimated costs and benefits at farm, post farm and total industry level**

Sectors	Before Research		After Research		Change	
	Revenue (\$m)	Cost (\$m)	Revenue (\$m)	Cost (\$m)	Revenue (\$m)	Cost (\$m)
Farm level	91	53	128	56	37	3
Post farm level	1,552	1,358	2,203	1,758	651	400
Total industry	1,643	1,411	2,331	1,814	688	403

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\*\* Differentiated wine grapes are used to produce differentiated wine and commodity wine grapes for commodity wine.



The last two columns in Table 1 give the incremental costs and benefits at farm, post-farm and industry levels.

#### ***4.2 Investment analysis***

Two types of costs are included in the investment analysis: the cost of the project which includes the cost of research and extension activities and the other is the incremental cost at the industry level, which includes the extra costs incurred by different sectors due to the adoption of new practices. Estimates of the cost of the research and extension activities are provided by DAFWA officers.

Other information used in the analysis is presented in Table 2. The costs and benefits are discounted at 7% discount rate to obtain the present value of costs and benefits.

***Table: 2***

#### ***Key assumptions used in the analysis***

Term of analysis	21yrs
Year in which project begins	1999
Year in which research and extension ends	2015
Year in which adoption begins	2005
Year in which adoption ends	2020
Year of peak adoption	2015
Proportion of benefits attributed to this research activity	30%
Percentage of farmers adopting the innovation in the long run	70%
Probability of success	50%

- Term of analysis refers to the period between the year of commencement of the project and the year in which benefits of the project end.
- The current Premium Wine project began in 1999. DAFWA's Wine project has had a major role in the development of the wine industry since the late 1950's/early 1960's when the potential for the cooler climate regions of the State's South West were identified. Since then the project in its various forms has triggered and encouraged the introduction and regional evaluation of many

of the premium wine grape varieties and clones, and improvements in viticultural and wine making practices for premium wine production upon which the industry is based. Further segmentation of the global wine market on quality and price since the early 2000's has led the project to refocus on 'differentiated' grape and wine production.

- Farmers are expected to adopt the innovations as soon as the new practices are released, even before the end of the project. Under this process of continuous adoption we assume that industry began to adopt innovations from the current project in 2005.
- By 2020, new technology is expected to take the place of the current techniques and management practices.
- Maximum adoption is expected to occur in 2015.
- Differentiated wine grape production demands cool climate, and at present 85% of the area of cultivation is suitable for differentiated wine production. The number of cool climate wine grape growers taking up the innovation is expected to lead to a 70% adoption.
- Although there is a high expectation about the probability of success a conservative figure of 50% is used in this analysis.
- Proportion of benefits attributed to this activity refers to the percentage of benefits exclusively coming from the adoption of the project results. Even though it is expected to be high, a conservative figure of 30% is used as there are many other innovators and research providers in the wine industry whose actions will also contribute to the total benefit.
- Total cost of research includes the cost of salaries, operating expenses and capital expenses for research and extension activities for the whole 21 years.
- The aim of the project is to attain at least a reduction of 20% of the 2005/06 cost of differentiated wine grapes production. However, in this analysis a 10% reduction is used.
- In recent years the share of production of grapes for differentiated and commodity wine was 30% and 70% respectively. The research aims to reverse these shares.
- Area and total quantity of wine production are assumed to remain unchanged throughout the period of analysis.

### *Other assumptions*

The following price and cost assumptions are made for the period considered in the analysis:

- Prices of both differentiated and commodity wine in domestic, Eastern states and overseas markets are assumed to be constant at the 2005/06 level.
- The relative proportions of the flow of both differentiated and commodity wine in domestic, eastern states and overseas markets are assumed to be constant.
- Operational costs for intermediate agencies are assumed to be constant.
- Price received by growers for both differentiated and commodity wine grape are also assumed to be constant.

Based on the above information, investment analysis of the project is undertaken using the Research Evaluation Spread sheet software developed by DAFWA.

## **5. Results**

Farm level and industry level (which includes farm and post farm sectors) results are presented in Table 3. Benefit cost ratios, net present values (NPV) and internal rates of return (IRR) are presented. The benefits per dollar of R&D investment are \$2.8 at the farm level and \$14.9 when total industry spill over effects are taken into account. The NPV of the research project is \$8.2m at farm level and \$98.8 for the industry as a whole. The IRR of the research project is 19% at farm level and 56% at the total industry level.

*Table: 3*

### *Project appraisal measures*

Measures	Farm level	Industry level
Present value of benefits (\$m)	12.7	105.9
Present value of costs (\$m)	4.5	7.1
<b>B:C ratio</b>	<b>2.8</b>	<b>14.9</b>
<b>NPV (\$m)</b>	<b>8.2</b>	<b>98.8</b>
<b>IRR (%)</b>	<b>19</b>	<b>56</b>

### *Sensitivity analysis*

The profitability of the research investment is likely to be sensitive to changes in some of the key assumptions, especially the level of adoption of new practices. To examine the robustness of findings the level of adoption is varied as shown in Table 4.

**Table: 4**

#### *Sensitivity of investment evaluation measures to changes in the adoption level*

Adoption level (%)	B:C ratio	
	Farm level	Whole industry level
<b>5</b>	<b>0.22</b>	<b>1.03</b>
10	0.44	2.07
20	0.88	4.13
<b>30</b>	<b>1.21</b>	<b>6.4</b>
40	1.6	8.5
50	2	10.7
60	2.4	12.8
70	2.8	14.9
80	3.2	17.1

The project is expected to generate favourable net returns (at the farm level) only if at least 30% of farmers adopt the innovations. However, at the whole industry level only 5% adoption by farmers is needed to ensure net returns to the entire industry are positive.

The shift in the production pattern (differentiated versus commodity wine grape production) is another important assumption likely to considerably influence the returns on research investment. Sensitivity analysis findings regarding the size of the shift are listed in Table 5.

**Table: 5.**

***Sensitivity of the proportion of differentiated wine on investment evaluation measures***

Proportion of differentiated and commodity wine	B:C ratio	
	Farm level	Whole industry level
<b>33:67</b>	<b>0.18</b>	<b>1.05</b>
35:65	0.30	1.75
<b>40:60</b>	<b>1.1</b>	<b>3.9</b>
50:50	1.63	7.6
60:40	2.23	11.3
70:30	2.8	14.9
80:20	3.4	18.6

The investment yields a return of \$3.90 per dollar invested for the total industry and \$1.1 at the farm level, even if there is a only a 10% shift in the proportion of differentiated wine from the current level proportion. At the total industry level, even if there is a shift of only 3% from commodity to differentiated wine, the project performs slightly better than break-even.

## **6. Discussion and Conclusions**

The results show that the premium wine grape project is likely to realise a return of \$14.9 per dollar invested when flow-on benefits are included. Restricting the appraisal to the farm-level yields benefits of \$2.8 per dollar invested. High values of project worth are found when flow-on benefits are included, indicating the importance of including these benefits in the investment evaluation of the research.

Returns to the investment in this R&D project will be substantially understated if benefits beyond the farm gate are excluded. Furthermore, because it is common practice in many agricultural research agencies to often only report on-farm benefits, it is likely that these agencies are understating the value of their research. Perhaps of even more importance is that, if research fund allocations are distributed across projects solely on the basis of their farm benefits, then socially inefficient allocations

are likely to arise. Where research is principally funded by taxpayers then the industry (multistage) benefits are a better indicator of social benefit than the sole consideration of farmer benefits. This is likely to especially apply to industries (e.g. dairy, sheep meat) that are subject significant processing and value-adding activity beyond the farm gate.

Noting that R&D investment in agriculture by the public sector in many developed countries appears to be in decline (Mullen, 2007; Mullen and Leanne, 2007; Pardey, Alston, and Piggott, 2006), perhaps then there is a role for analyses of agricultural R&D to especially report the farm and flow-on benefits of this research. It may be that focusing on farm-level outcomes has contributed to agricultural R&D being perceived as less profitable or worthwhile than is the truly the case, when industry-wide (multi-stage) benefits are included.

The results in this paper indicate that research policy and funding mechanisms for agricultural R&D are important economic issues, especially where benefits are widely dispersed across supply chains. Currently, much of the funding of agricultural R&D in Australia comes from taxpayers, with additional support from farmers through their compulsory payment of product levies. In the case of the wine industry, research funds come from levy collections on growers and winery owners. These funds are matched by an equal amount of government (taxpayer) funds. However wholesalers, retailers and exporters free ride on the benefits of the R&D paid for by these other groups. Given the size and share of benefits distributed across the supply chain, it could be argued that a more equitable and efficient mechanism for funding wine R&D should be developed. What should be the nature or mechanisms of the funding model is beyond the scope of this paper but should be a focus of further work. The findings in this paper suggest that, in light of the size of the supply chain benefits, some of the current beneficiaries of the R&D in the supply chain should contribute much more to the funding of this agricultural R&D.

In conclusion, a value chain model of the Western Australian wine industry is used in this paper to highlight the relative importance of farm and flow-on benefits generated by farm-level R&D. The benefits per dollar of R&D investment are found to be \$2.8 at the farm level compared to \$14.9 when flow-on benefits are taken into account. In

this case, solely reporting farm level benefits hugely understates the returns to the R&D investment. One of the main R&D policy implications of these findings is that reporting on flow-on or supply chain benefits is essential in industries where substantial value-adding and benefit transfer can occur across their supply chains; otherwise underinvestment in agricultural R&D may occur due to the perception that few benefits (farm-level only) are generated. Furthermore, the current funding mechanism for wine R&D in Australia enables some current beneficiaries of farm-level R&D to free ride on these R&D investments. There is a need to review the equity and efficiency of the current mechanism for funding wine R&D.

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## **Appendix-I**

### **Value chain model**

A value chain model gives a detailed physical and financial description of an industry's production, processing and retailing (including export of goods and services) activities. Value added contributions of different industries as well as different sectors are worked out after identifying the flow of product in the chain.

This provides an understanding of:

- how one part of the industry interrelates with all other parts of the industry;
- the levels of costs and incomes throughout the industry; and
- the contribution of each part of the industry to total industry output.

The model is developed using computer spreadsheets and is structured to illustrate the product and money flows which occur within and between the sectors of the industry. The model provides an overview of the industry and the linkages between the industry and other parts of the economy, including consumers.

In an industry, each physical input or output is linked directly to a price, therefore, the model also specifies financial information for each sector of the industry, including:

- the value of products brought forward from previous processing stages;
- the costs of materials and services purchased from outside the chain;
- income accruing at each stage from sales of products;
- transport, storage and handling costs incurred in moving products between processing stages; and
- the difference in total income earned and the total costs of inputs purchased, which is equivalent to operating profit or, in economic terms, value-added.

By describing the linkages the model shows the contribution of production, processing and marketing activities to the State, regional or industry economies.

(Source: Islam, 2003).

## Appendix-II

### **Data, assumptions and other information used in the model.**

Data was collected mainly through consultation with the research team, by referencing reports and published information from a variety of sources including WIAWA. Sectors involved in the production and marketing of the product is identified separately, and flow of the product between these sectors or linkages between these sectors are established in consultation with the industry experts both in the department and in the industry.

An overview of the data and assumptions used in the model is discussed below.

#### ***1.1. Assumptions used in the model***

1. Grapes produced in cool climate are used for the production of differentiated wine and warm inland production is used for commodity wine.
2. One tonne of grapes produce 700 litres of wine, and hence from one tonne of grape, 933 bottles of 750 ml capacity can be produced.
3. Only differentiated wine is sold through cellar door and mail order sale.
4. The total value of the cellar door and mail order sale is assumed to be less than \$300,000/year for 75 per cent of the sales.
5. Bars and restaurants sell the product by bottle and by glass. When a bottle is sold as glasses, one bottle of wine will make 5 glasses.
6. Sale of commodity wine in bars and restaurants is less than that of differentiated wine.

#### ***1.2 Summary of product flow share assumptions***

The product flows from grower through different sectors till it reaches the end consumer. Flow of the product also varies between differentiated and commodity wine. Flow is given in Table 1.

**Table 1.**

***Flow of the product in wine industry***

	Winery (diff.)	Winery (com.)	Wholesale r	Retailer	E.S. exporter	O.S. exporter
Grower (diff.)	100	0	0	0	0	0
Grower (com.)	0	100	0	0	0	0
Winery (diff.)	0	0	23	20	36	21
Winery (com.)	0	0	27	11	42	20
Wholesaler	0	0	0	100	0	0

In the case of differentiated wine, retail section includes winery retail through cellar door and mail order sale as well.

**1.3 Summary of production, cost and price data.**

Different sources of published data are used for production, cost and price estimation. In the absence of published data, assumptions are made after discussion with industry experts, about the quantity produced or handled by different sectors, cost of production/operation and average price realised. When data on costs and prices of different input and output items were not available (mostly in non-farm sectors) the following steps and assumptions were made across all sectors to estimate profit. (The method is adopted from Islam 1997).

1. As a measure of profit 7.8% is deducted from the price that the sector sells its good to another sector. The rate of 7.8% is chosen so that after deducting company tax of 36% from it, a return of 5% accrues on a sector's annual expenditure. A return of 5% upon annual expenditure is chosen because it is assumed that the sector concerned is reasonably competitive and so may be thought of as making the same long run return as government bonds.
2. The profit per unit of product is deducted from the sector's final selling price, to give the total cost per unit. From total cost the sum of the prices of the inputs from other sectors are deducted. The remaining portion of total cost is distributed between costs arising from inputs from external sources.
  - The cost of interest is assumed to be 7.5% of total costs.

- The cost of rent is assumed to be 2% of total costs.
  - The cost of labour is assumed to be 50% of the costs arising from inputs from external sources.
3. Other costs are treated as residual and are distributed as further cost structure information becomes available.

Source: Islam, 1997.

A summary of the basic data used in the model is presented in the table below. (Please note that the cost given is only the operational cost and not the total cost incurred by the sectors.)

**Table 2.**

***Data/assumptions on production, cost and prices***

Sectors	Production in tonnes/bottles or no. of bottles handled		Cost per tonne or per bottle		Average price per tonne or per bottle	
	Differentiated	Commodity	Differentiated	Commodity	Differentiated	Commodity
Grower	25,200	58,800	827.76	550.46	1850	750
Winery	23,511,600	54,860,400	5.63	3.74	9.78	5.29
Wholesaler	14,812,308	20,219,976	0.87	0.87	20.02	7
Retailer	6,348,132	25,784,388	1.75	1.75	33.13	8.65
Eastern state exporter	14,812,308	5,407,668	0.83	0.83	13	6
Overseas exporter	4,937,436	6,034,644	0.74	0.74	10	5

Warm inland production is having the economies of scale and low production cost. But cool climate production is more profitable because of the high price it fetches in the market due to its premium quality. Differentiated winery is getting a good margin which is mainly due to cellar door and mail order sale. But it has to pay a Wine Equalisation Tax (WET) of 29 per cent of the selling price, if the cellar door sale exceeds \$300,000/annum. Wineries having cellar door sale of less than 300,000/annum is exempted from WET. As WET is calculated at the last wholesale

sale, winery has to pay WET for that portion which it sells to the retailer directly. Similarly, wholesaler has to pay WET for the whole amount handled by him.

Based on this information, the financial picture of each sector involved in production/handling the product is established, and added together accordingly to get the information about the total costs, total benefits and value added by the industry as a whole.